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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,989	07/28/2003	Sudhir Gondhalekar	A7728/T48810	7726

7590

10/18/2005

Patent Counsel  
Applied Materials, Inc.  
Legal Affairs Department  
P.O. Box 450A, M/S 2061  
Santa Clara, CA 95052

EXAMINER
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DHINGRA, RAKESH KUMAR

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

16

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/630,989	GONDHALEKAR ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Rakesh K. Dhingra	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 16 August 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 21-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 21-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### Election/Restrictions

Claim 13-20 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention (Group II), there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 8/16/05.

### Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1, 4, 5, 8, 9, 10, 12 are rejected under 35 U.S.C. 102 (b) as being unpatentable over Yoshida et al (Pub. No. 08-097188) in view of Sanders et al (US Patent No. 5,120,930) and Vella (US Patent No. 6,545,419).**

Regarding Claim 1: Yoshida et al teach an apparatus (Figure 1) for processing semiconductor substrates, the apparatus comprising:

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a chamber defining a processing region therein (per paragraph 0008, not shown in the Figure 1);

a substrate support disposed in the chamber to support a semiconductor substrate 24 (shown in Figure 1, but not labeled);

at least one nozzle 11 extending into the chamber to introduce a process gas into the chamber through a nozzle opening; and

at least one heat shield 15, disposed around at least a portion of one of the at least one nozzle, the heat shield having an extension which projects distally of the nozzle opening of the nozzle and which includes a heat shield opening for the process gas to flow there through from the nozzle opening.

Yoshida et al do not teach the gap between heat shield and nozzle.

Sanders et al teach an apparatus (Figures 3A, 3B) that has nozzle body 16, a nozzle shield 38 and a passage (space) 40 between them. Sanders et al further teach that dimensions of passages (gap) will vary (optimized) in an interrelated manner with other process and operating parameters (Column 6, lines 5-20 and Column 8, lines 46-50).

Further, thickness of heat shield is also normally dependent (optimized) upon the temperature generated in the process area (Vella -Column 7, lines 50-57).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize passage spacing between nozzle and shield and also to optimize the thickness of heat shield as taught by Sanders et al and Vella in the apparatus of Yoshida et al to effectively shield nozzle from the heat due to plasma.

Further, it has been held in Courts (Case Law):

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“It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).”

“It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).”

“Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).”

Regarding Claims 4,12: Yoshida et al teach (per Figure 1) that the heat shield 15 is shown as extending beyond tip of Nozzle 11.

Regarding Claim 5: Yoshida et al teach (per Figure 1) that the heat shield 15 is disposed around substantially the entire nozzle 11 extending inside the vacuum chamber which is not shown in the figure 1 (Paragraph 0008).

Regarding Claim 8: Yoshida et al teach that the heat shield 15 comprises a hollow cylindrical (tubing) member (Paragraph 0008).

Regarding Claim 9: Yoshida et al teach (Paragraphs 0008 – 0012, and Figure1) about a heat shield 15 for shielding a nozzle 11 extending into a chamber to introduce a process gas into the chamber through a nozzle opening, wherein the chamber defines a processing region therein and has a substrate support to support a semiconductor substrate 24 for processing in the chamber, the heat shield comprising:

a hollow member 15 configured to be coupled with the nozzle 11 and having an internal dimension sufficiently large to be disposed around at least a portion of the nozzle, the hollow member 15 having an extension which projects distally of the nozzle opening of the nozzle and which includes a heat shield opening for the process gas to flow there

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through from the nozzle opening. Further, Sanders et al teach an apparatus (Figures 3A, 3B) that has nozzle body 16, a nozzle shield 38 and a passage (space) 40 between them. Sanders et al further teach that dimensions of passages (gap) will vary (optimized) in an interrelated manner with other process and operating parameters (Column 6, lines 5-20 and Column 8, lines 46-50). Thickness of heat shield is also normally dependent (optimized) upon the temperature generated in the process area (Vella - Column 7, lines 50-57).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize passage spacing between nozzle and shield and also to optimize the thickness of heat shield as taught by Sanders et al and Vella in the apparatus of Yoshida et al to effectively shield nozzle from the heat due to plasma.

Further, it has been held in Courts (Case Law):

“It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).”

“It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).”

“Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).”

Regarding Claim 10: Yoshida et al teach (Paragraph 0008 and Figure 1) that the heat shield 15 of claim 9 is a hollow member and which is cylindrical, and has an internal cross-section, which is slightly larger than an external cross-section of the nozzle 11.

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**Claims 2, 3, 11 are rejected under 35 U.S.C. (a) as being unpatentable over Yoshida et al (Pub. No. 08-097188) in view of Sanders et al (US Patent No. 5,120,930 and Vella (US Patent No. 6,545,419) as applied to Claims 1, 9 and further in view of Tsukune (JP Pub. No. 09- 134880).**

Regarding Claims 2,11: Yoshida et al in view of Sanders et al and Vella teach all limitations of the claims except for the material of the heat shield. Tsukune teaches a CVD equipment (Figures 1-5) with a shutter 41 around a gas a nozzle, for shielding the gate 13 from heater 15, resulting in improved film thickness distribution (paragraph 0021). Tsukune also teaches (paragraph 0022) that the body 43 of shutter can be made from ceramic (Paragraph 0022).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize ceramic material for heat shield as taught by Tsukune in the apparatus of Yoshida et al in view of Sanders et al and Vella to obtain improved film thickness distribution.

Regarding Claim 3: Tsukune teaches (as explained above) that the body 43 of shutter can be made of Alumina (Aluminium Oxide), Silicon carbide, and a ceramic like metal nitride (Paragraph 0022).

**Claims 6, 7 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Yoshida et al (Pub. No. 08-097188) in view of Sanders et al (US Patent No. 5,120,930) and Vella (US Patent No. 6,545,419) as applied to Claim 1 and further in view of Narwankar et al (US Patent No. 6,200,911 B1)**

Regarding Claim 6, 7: Per Figure 1, Yoshida et al in view of Sanders et al and Vella teach all limitations of claims 6, 7 except for plurality of nozzles.

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Narwankar et al teach plurality of gas nozzles that provide a uniform flow of gas over the substrate (column 6, lines 45-50), in a high density plasma CVD system.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use plurality of nozzles with heat shields in the apparatus of Yoshida et al in view of Sanders et al and Vella to obtain a uniform flow of gas over the substrate.

**Claims 21-24 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Yoshida et al (Pub. No. 08-097188) in view of Sanders et al (US Patent No. 5,120,930 and Vella (US Patent No. 6,545,419) as applied to Claims 1, 9 and further in view of Whittaker (US Patent No. 6,755,355).**

Regarding Claims 22, 24: Yoshida et al in view of Sanders et al and Vella teach all limitations of the claims except coupling of heat shield to nozzle by threads.

Whittaker teaches an apparatus (Figures 3, 3A, 3B) that has a heat shield 76 coupled to nozzle injector assembly 30 by means of threaded projection 74 (Column 5, line 54 to Column 6, line 35).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a threaded coupling between heat shield and nozzle as taught by Whittaker in the apparatus of Yoshida et al in view of Sanders et al and Vella to prevent damage to nozzle (Abstract).

Regarding Claims 21, 23: Whittaker teaches that per prior art shield is formed as an integral ring around the nozzle orifice (Column 2, lines 24-31).

### ***Response to Arguments***

Applicant's arguments filed on 8/16/05 with respect to claims 1-12 have been considered but are moot in view of the new ground of rejection as explained below:



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Applicant has added new limitation in claims 1, 9 which recites – “the heat shield being spaced from the nozzle by a gap wherein the gap between the heat shield and the nozzle is smaller than a thickness of the heat shield” by amending the Claims 1, 9 and for which new reference by Sanders et al (US Patent No. 5,120,930 as evidenced by Vella, US Patent No. 6,545,419) has been found that reads on this limitation.

Accordingly claims 1-12 have been rejected as explained above.

As regards new claims 21-24, a reference by Whittaker (US Patent No. 6,755,355) has been found which reads on these claims and accordingly these claims have also been rejected as explained above.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rakesh Dhingra



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